

**STAKEHOLDER MEETING SUMMARY**  
**ETV DRINKING WATER SYSTEMS CENTER**  
**NOVEMBER 19, 2002**

The following text is a summary of the discussions that resulted from the Stakeholder Meeting that was held at NSF International, Ann Arbor, Michigan on November 19, 2002. Text in ***bold italics*** indicates issues that the Environmental Technology Verification (ETV) Drinking Water Systems (DWS) Center would like to receive comments on from its stakeholders.

The meeting commenced at 8:30am. The revised agenda timeline is attached at the end of these meeting minutes. Bruce Bartley, the NSF ETV DWS Center Manager, began by reviewing the Antitrust Statement, as found in the meeting packet. Kevin Brown, ETV Steering Committee (SC) Chairman, then welcomed the group and asked all meeting attendees to introduce themselves (a list of attendees is available upon request from Angela Beach at [beach@nsf.org](mailto:beach@nsf.org)). Kevin welcomed one new Steering Committee member, Mr. E. Buck Henderson, Manager in the Public Drinking Water Section of the Texas Commission on Environmental Quality, and also welcomed the new Project Coordinator with the DWS Center, Mr. Michael Blumenstein. Kevin also formally thanked a State representative who is departing the SC, Mr. Ed Urheim from the Georgia Department of Natural Resources. Kevin and Bruce also welcomed Ms. Teresa Harten to her first ETV DWS Center Stakeholder meeting, since becoming the ETV Program Director.

**ETV Program Update**

Teresa Harten expressed that she was honored to be at the meeting and was excited to see and meet all of the attendees. Teresa presented an ETV Status Update slide presentation. These slides are provided as an attachment to these meeting minutes. As of September 2002, there have been 194 technologies verified and 72 Protocols developed (includes figures from all ETV Centers: including Air Pollution Control, DWS, Greenhouse Gas, Advanced Monitoring Systems (AMS), Water Quality Protection (WQP), and Building Decontamination). At the moment, there are 94 technologies in testing and 135 applications pending. In addition, vendors from fifteen different foreign countries have participated in ETV. The website is also doing well with 10% of the hits being international. The ETV Program is also involved in a new role in homeland security verifications. The new homeland security role of ETV will include a rapid verification process, building on existing centers with one new center, and exploring collaborations with existing HS center within the government.

In January of 2002, the National Advisory Council for Environmental Policy and Technology (NACEPT) recommended that the ETV Program expand so that the EPA can continue to identify and bring to the market the best practices and cost-effective environmental technologies. Teresa expressed the key points to the future of ETV including that:

- Environmental technology performance verification is central to EPA mission,
- A need exists for additional verification areas, and
- Challenges remain.

The following were noted as challenges to the ETV Program that are currently being addressed:

- Funding and partnering to meet demand and need;
- Expanding into new centers including homeland security, P2, water infrastructure, etc.;
- Addressing the SAB recommendation for increased scope of verifications while controlling cost and time to verify;
- Policing vendor use of verification information;
- Coordinating with the international community; and
- Monitoring and assessing program impact and outcomes.

Another topic that was discussed was the issue of measuring outputs versus outcomes and the need to measure or quantify them. Examples of outputs are the number of protocols and verifications and the values placed on ETV by vendors. As ETV continues, the outcomes must be measured in order to see the positive effects of the outputs, such as reduced exposure and reduced risk because of ETV and improved health and environmental quality because of ETV. ***Teresa asked the group for ideas of ways to quantify and measure the outcomes. Any suggestions can be brought to the attention of the DWS Center.***

Teresa went over a few of the main points from the Science Advisory Board (SAB) review in 2001. One suggestion from the SAB was to provide more comparisons of verified products. The ETV Program does not compare products but allows for improved comparability of products by individuals. Another suggestion from the SAB is to increase the verification scope to include operations and maintenance (O&M), longer term testing, life cycle costs, and generally more factors. The ETV Program agrees with this approach but must also consider testing costs. Lastly, the SAB recommended increasing the proportion of stakeholders with environmental groups, financiers, and underwriters; the ETV Program also agrees with this approach and continues to broaden its stakeholder outreach.

Cost sharing is a major focus at the moment within the ETV Program. Two ways to help fund verifications include a goal of obtaining 30% cost share from other organizations for total ETV costs for 2003 to 2006 and considering a two or more tier cost share structure. This two tier cost share structure would include an evaluation of the size of the vendor and base ETV funds accordingly. The Small Business Innovative Research Program (SBIR) defines a small business as less than 500 employees.

***Teresa requested input on this proposed two-tier cost sharing structure.***

In terms of the two tier cost structure, David Pearson explained that many times the size of the company does not affect the market demand of a product. A large company may produce a product that has a very small market, which means a higher risk and should be considered when determining the cost of verification testing. Glen Latimer added that the current structure is important to keep all vendors at the same level. Glen also suggested the idea of a “scholarship” structure or a loan structure for additional help with testing. Harold Fravel added that the evaluation of the size of a company shouldn’t only look at the parent company; some companies have smaller divisions that have less and/or different funds than the parent company.

The last two slides presented the past and future estimates of the number of verifications, funding, and outputs. The graphs show a leveling off of verifications at about 30 per year and a leveling off of ETV total funds at around \$4.5 Million.

### **ETV Drinking Water Systems Center Overview**

Bruce Bartley presented an overview of the scope, mission, and purpose of the ETV DWS Center, for those attendees who were attending the annual stakeholder meeting for the first time. The ETV DWS Center Stakeholder Meeting slides are provided as an attachment at the end of these meeting minutes. One of the highlights of the presentation focused on the future challenges facing the DWS Center. One challenge is the struggle between high testing costs for verification versus low cost technologies. There has also been much interest in ETV by technology innovators, but no ETV funds for new protocol development. The Center will continue to face and deal with these challenges.

### **ETV Drinking Water Systems Center Update**

Kristie Wilhelm presented the verification testing status. To date, the DWS Center has published 27 verification reports, including 4 in the past year, and has 8 verifications currently in progress. A list of the verifications completed and in progress can be found in the meeting packet and on the website,

[www.nsf.org/etv/dws](http://www.nsf.org/etv/dws). Angela Beach presented the protocol and test plan status. During the past fiscal year, the DWS Center has updated 29 protocols and test plans, including 8 protocols and 21 technology specific test plans (TSTPs). There are 4 revisions in progress, which involve the Microbiological Inactivation Protocol and its 3 TSTPs. 2 new TSTPs are planned for 2003 for adsorptive media technologies to remove SOCs and VOCs. There are also 3 TSTP revisions planned for 2003 for the adsorptive media TSTP, the UF/MF membrane TSTP, and the bag and cartridge TSTP.

Robert Mann brought up the issue of existing data from vendors. Bruce Bartley explained that the DWS Center follows the ETV Program's guidelines for existing data that includes extensive O&M manual and 2-3 peer reviews. Pat Cook also suggested pulling a verification together from systems that are already installed and are currently running. ***To address this issue and possible revision of the DWS Center policy, the DWS Center proposed to hold a conference call with any interested parties.***

### **Future Water Security Projects**

Bruce Bartley presented the new water security (WS) focus of the DWS Center. These slides are included within the ETV DWS Center Stakeholder Meeting slides, which are found at the end of these minutes. The funding for this new task focuses on residential point-of-use (POU) devices for an additional barrier of protection. The technical advisory panel includes experts from the Center for Disease Control (CDC), Department of Defense (DOD), and utilities. This project will first focus on barrier systems, then chemical barriers, and finally others, as funds allow. This project will also use "fast track reporting" with a leaner verification report and the PSTP included in the appendix. Other types of WS systems to be verified in the future may include vulnerability reduction technologies (e.g. on-site generation disinfectant) and package plants to temporarily produce drinking water while the permanent system is decontaminated. Decontamination technologies will be a focus for the ETV WQP Center. ***The DWS Center is requesting suggestions from its stakeholders on other types of drinking water treatment systems that could be verified to address water security issues.*** A suggestion that was previously brought to the Center was for system locking devices.

Kevin Brown inquired about whether this focus on WS by the DWS Center has already been given to the Center by the EPA and also about the source of funds. Bruce Bartley responded that yes, the funding for this new task has already been allotted to NSF and the project is moving forward. The funds are from a unique source of funds from special appropriations from the Office of Water. Teresa speculated that the future funding for water security might come from the Homeland Security bill. A question was raised about whether devices for rapid identification of contamination were being considered. Bruce responded that yes, these types of systems are being verified by Battelle, who manages the ETV AMS Center. More information about the AMS Center can be found on the EPA ETV website, [www.epa.gov/etv](http://www.epa.gov/etv).

Gary Logsdon added that the Army used to test mobile drinking water treatment systems. Jeff indicated that he has had talks with other agencies inquiring about a consortium between the Army, Navy, and the United States Bureau of Reclamation (USBR) to share information. A meeting is coming up in January with these groups that he will be attending. Robert Mann indicated that some states have had difficulties gaining access to these types of mobile technologies and that they are the people that need this information. Bruce asked the states if this information would be a benefit to them and they indicated that it would and is a high priority. Buck Henderson also stressed that storage tanks where decontamination of the water could take place before discharge and storage tanks to store water after decontamination would also be a benefit. Glen Latimer added that his company periodically gets calls from utilities for systems needed as soon as possible; however, they just do not get enough of these calls to warrant manufacturing systems before they are needed. David Pearson also suggested assessing the vulnerability of systems when integrity is compromised, i.e. a contaminant that is added that actually destroys the membrane fibers.

Robert Mann inquired about the mobilization of the information once the technologies are verified. What is next in terms of distributing the information? Bruce replied that like other drinking water verifications, the verification reports will be posted on the website. Gordon Bellen added that NSF also has a consumer hotline for individuals needing more information on drinking water systems. How to market these technologies to the public may be out of ETV's scope and in need of more intensive research. In terms of the safe buildings area, the First Responders are the main focus group when verifying those types of technologies. Bruce asked Steve Allgeier if the EPA has a plan yet for releasing this information to the public. Steve responded that the EPA has not had full discussion on this issue but that, in his opinion, the primary purpose of verifying POU devices is to find a way to provide the information out to the public. Gordon added that if we are successful in verifying that these POU technologies do work in emergency situations, the bigger issue will be getting accurate information and data out to the public and defining the uses of the technologies accurately.

10:15-10:30 AM – BREAK

### **Protocol Developments and Modifications**

#### **Harmonization of ETV Protocols with the Enhance Surface Water Treatment Rule -Long Term 2 (LT2)**

##### **Membrane Filtration**

Steve Allgeier presented and summarized the proposed Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) as it relates to membrane filtration. The slides for this presentation are attached at the end of these minutes. The LT2 rule will encompass product specific challenge testing for *Cryptosporidium* and cover microfiltration (MF), ultrafiltration (UF), nanofiltration (NF) and reverse osmosis (RO) technologies. The regulatory definition of membrane filtration for these types of systems includes a pressure or vacuum driven separation process, it removes particles greater than 1 µm size by exclusion, and can be direct integrity tested. Removal efficiency will be established through challenge testing and direct integrity testing. Direct integrity testing will be periodically measured as well as continuous indirect integrity monitoring during use. The framework for removal credits will include a potential removal credit up to 5.5 logs and can be for a potential "stand-alone" technology. The maximum credit is the lower value of either the removal efficiency demonstrated during challenge testing or the maximum log removal value that can be verified through direct integrity testing. The credit for existing membrane plants will be determined by the primacy agency under LT2/ESWTR or based on LT2ESWTR criteria.

When selecting a conservative surrogate for *Cryptosporidium*, there must be direct comparison of the surrogate and consideration of the physical characteristics, including that the size distribution be conservative (<1 µm), that they are dispersed in solution, that no significant change occurs to the surrogate, and that they are discretely quantifiable.

When considering the challenge of product variability, the LT2 rule does not require testing a specific number of modules but that a manufacturer must verify the performance of modules not tested. Small-scale pilot testing will be viable as opposed to full scale testing. Nondestructive performance test and a control limit will be applied to production modules as well as testing conservative modules during the challenge test. In summary, the LT2ESWTR is an opportunity to properly address membrane filtration in the federal regulations. Higher removal credit may be awarded to membrane processes based on performance. Challenge testing demonstrates the removal efficiency of an integral membrane. Direct integrity testing verifies removal efficiency at a level commensurate with removal credit. Continuous monitoring provides some indication of process performance between integrity tests. For more

information about the proposed rule, please go the EPA website, [www.epa.gov/safewater/mdbp/mdbp.html](http://www.epa.gov/safewater/mdbp/mdbp.html).

Modification of the ETV Test Plan for Membrane Filtration for Particulate and Microbial Reduction to include laboratory bench scale testing for microbial removal

Joe Jacangelo presented and summarized the proposed modifications and additions to the ETV Protocol. The slides for this presentation are attached at the end of these minutes. Due to a recent trend of not allowing microorganisms to be brought on-site at utilities for seeding at pilot scale, the DWS Center previously requested comments from its stakeholders to include an optional bench-scale task within the ETV protocol. Some key aspects of the proposed bench-scale membrane testing protocol are:

- Low-pressure membrane testing unit easy to construct and operate;
- Accommodates many types of membranes;
- Reduces microbial seeding costs as compared to pilot-scale experiments;
- Reduces time to conduct experiments;
- Tests true removal capabilities of membranes; and
- Harmonizes with LT2ESWTR proposed guidance.

Joe highlighted that this new task in the ETV protocol will measure the removal capacity of the membrane material used by manufacturers and will be an optional way in which to evaluate microbial removal capabilities for ETV. This new task in the protocol will not be a substitute for complete pilot testing, it will not be a substitute for integrity testing, and will not be a substitute for pilot evaluation of microbial removal by membranes and systems; rather it will be an alternative option for verifying microbial removal. The final part of Joe's presentation slides highlighted a few comments that were previously raised about the bench scale testing. These slides also present the DWS Center's responses to these comments.

Gordon asked how the test in the lab, which is performed on clean water, would be compared to the field test. Joe responded that the lab tests provide an integral evaluation of the membrane and if the membrane keeps its integrity in the field, the membrane should still have the same removal capability as measured in the lab. Glen Latimer then questioned whether the test plan would still consider the integrity of the entire system, e.g. valves, tubing, seals, etc. Joe and Steve reiterated that yes, the integrity of the entire system is still measured in the field. David Pearson pointed out that the LT2 rule covers all membranes from UF to RO systems, whereas the TSTP that Joe presented is only applicable to MF and UF systems. He then asked if the intention of the LT2 rule is to still require challenge testing of MF/UF and RO systems since, by nature, they exclude bacteria when the integrity of the system is still intact. Steve responded that federal regulation requires challenge testing for *Cryptosporidium* removal credit for all membranes.

Bruce then presented comments that the DWS Center received from the International Diatomite Producers Association (IDPA) to the group. This letter from IDPA is attached at the end of these minutes. The comments generally stated that they were opposed to the laboratory testing since it puts diatomaceous earth technologies at a competitive disadvantage. Steve explained that to meet the proposed membrane regulatory requirements, testing at bench scale is not mandatory. . Gordon then made the comment that we couldn't guarantee the equivalence of the cost of testing between difference types of technologies. He would encourage this organization to try to come up with an equivalent bench scale test for diatomaceous earth (DE) products, but that we shouldn't hold up this opportunity to test membranes at the bench-scale level because of these comments and perceived bias. The steering committee agreed with this comment.

Robert Mann asked if DE is even specified in the LT2 rule. Bruce and Steve Via agreed that DE is covered under LT1 as a possible pre-coat technology, but is not in the LT2 rule. Pat Cook added that the

LT1 rule allows for a 2-log credit for *Crypto* removal with proper turbidity requirements. Steve Via added that LT2 provides guidance above and beyond LT1 and the Interim Enhanced Surface Water Treatment Rule (IESWTR). Steve Allgeier also added that a high *Crypto* bin makes LT2 required; otherwise, it is not applicable.

Gary Logsdon pointed out that there is a specific difference between the operation of membrane systems and DE filtration. The manufacturer prepares the membrane and puts them in the module. With DE, the manufacturer prepares the device to hold the filter aid and the water works operator applies the DE on the septum. There exists a more operator dependent performance with DE systems. He is hesitant in agreeing with a small scale approach to test DE systems because it would be harder to justify that the system would obtain that kind of performance level in the field. Gordon pointed out that the proposed modifications to the membrane test plan are not eliminating field-testing as the comments from IDPA implies. Bruce suggested that IDPA could make a presentation to the group to present an alternative bench scale test for DE at the next SC meeting.

Kristie Wilhelm responded to Bob Mann explaining that the comments from IDPA do not imply that DE is covered under the LT2 rule; they are just making a case for bench scale testing of DE technologies independent of the LT2 rule. David Pearson asked if credit could be given from field-testing a DE unit. Kristie and Bruce responded that DE units can be verified under ETV and ETV would provide data to the state for the state to make their own decision.

### **Bag and Cartridge Filtration**

Steve Allgeier presented and summarized the guidance for bag and cartridge filtration within the proposed LT2ESWTR. The slides for this presentation are attached at the end of these minutes. The EPA is proposing a 1-log *Crypto* removal credit for bag filters and 2-log *Crypto* removal credit for cartridge filter through challenge testing. In addition, a 1-log factor of safety is applied. This means for a bag filter to get a 1-log credit, it must demonstrate 2-log removal. For a cartridge filter to receive a 2-log credit, it must demonstrate 3-log removal. The regulatory definition of bag and cartridge includes:

- Pressure driven separation process;
- Removes particles >1 µm by size exclusion;
- Use of engineered porous media with removal through either surface or depth filtration;
- Bag filters are not-rigid, fabric media; flow inside bag to outside;
- Cartridge filters are rigid or semi-rigid, self-supporting elements; flow from outside of cartridge to inside.

The framework for removal credits is product specific for challenge testing of *Crypto* removal. This includes a full scale filter element, *Crypto* or surrogate removed with no more efficiently than *Crypto*, maximum design flow rate, and challenged within 2 hours of start up, at 45-50% headloss and at 100% headloss. Currently, the ETV test plan specifies that the 3<sup>rd</sup> challenge take place at >90% headloss, as opposed to 100%. Gathering the data at this point does not allow the utility to see what happens at 100% headloss and does not provide data to support operation beyond 90%. In the LT2 rule, the log removal value (LRV) will be calculated from the challenges. If fewer than 20 LRVs are generated, then the removal efficiency is set to the lowest LRV observed. In the case of 20 or more LRVs, efficiency is equal to the 10<sup>th</sup> percentile of the LRVs observed.

Steve made a comment that some ETV/independent testing is showing some bag and cartridge filters not being able to get any credit. A suggestion was made to put a few bag and cartridge filters in series and to sample after each filter. Jeff Adams pointed out that both of the ETV tests that were done included two filters (either a bag and cartridge or dual bag) in line and Steve recalled that those systems didn't perform up to the point where many states would be comfortable with their *Cryptosporidium* removal credit. Jeff suggested that vendors might want to market their systems as a three-module system.

David Pearson asked if a ‘black box’ type of system is capable of removing microbes, can’t that be applicable to test in ETV? Bruce responded that to test under ETV, the design schematics and components of the treatment train must be disclosed. Joe questioned the concept of using the 10<sup>th</sup> percentile for efficiency when 20 or more LRVs are calculated and what would happen if a slug comes through of *Crypto*. Steve Allgeier and Steve Via agreed that the values at 0%, 50%, and 100% are discrete values; the goal of LT2 is about the average of *Crypto* removal not the extremes. Jeff then commented that the worst performance that was observed during in-house testing at the EPA is at terminal headloss. It is important to see the performance and vulnerability at that point. David asked if there was a way to get quality control data from the manufacturer and Steve replied that he along with NSF have been working on an approach to test for product variability. Gary asked about whether the LRV number of 20 applies to 20 tests of 3 challenges or 7 tests of 3 challenges since *Cryptosporidium* challenge testing can be very costly. Steve clarified that it corresponds to 7 tests of 3 challenges. Cost issues have been considered in writing the guidance.

Modification of the ETV Test Plan for Bag and Cartridge Filtration for Particulate and Microbial Reduction to include laboratory testing with radiolabeled microspheres

(Section 6.2.2 – please see additional information attached for this section)

Kristie presented what the DWS Center plans are to modify the existing TSTP for bag and cartridge systems. The objectives of the changes are to alleviate water security issues inherent with using microorganisms or surrogates at utilities, to harmonize with the LT2 guidance, and to reduce the cost of testing. The ETV TSTP currently requires an initial test period, before the 30-day test period, with 3 filters of the same lot and 3 filters from 3 different lots with measurements of turbidity and particle counts required, not *Cryptosporidium*. The field-testing task requires field challenges with *Crypto* or microspheres with sampling at 0%, 50%, and 90% headloss for a total of at least 9 total effluent samples.

Kristie explained that the draft preamble to the LT2 rule requires microbial or surrogate challenge testing on numerous filters (up to 20 challenge data points), challenge tests at 0%, 50%, and 100% headloss, and could involve 3 times the number of challenge data points as in the ETV test plan. To harmonize with LT2, the DWS Center is proposing the following:

- Challenge tests in laboratory
- Challenge tests with *Crypto* or microspheres
  - 4 filters from the same lot
  - 1 filter from each of 8 different lots
  - For a total of 12 filters tested
- Run the challenges only at start up (approximately zero headloss) to establish lot-to-lot variability.
- Require characterization of water quality – particle counts and turbidity
- 30-day test in the field. ***Kristie asked the states to consider if 30 days is the right amount of time and how many filter changes are enough. States that wish to comment on this should contact the DWS Center by January 5<sup>th</sup>, 2003.***
  - Turbidity, particle counts and pressure readings with on-line instrumentation. Currently the test plan calls for on-line instrumentation for the effluent only, not for the influent.
- On-line particle count data used to establish log removal credit

The EPA responded to the DWS Center proposals that:

- Laboratory challenge testing is consistent with LT2 language
- Use of field particle count data for log removal credit is not allowed under the proposed LT2
  - They suggested that a study and extensive amount of data are necessary to establish correlation between *Crypto* removal and particle removal

- They also suggested that variability in particle characteristics in natural waters may be such that one would need to perform a direct verification that particle counts were conservative for each challenge test

Some feed back from the states indicated that particle counts are being used to establish log removal credits for alternative treatment technologies. Kristie opened the issue of testing bag and cartridges for Crypto removal to all stakeholders for comments.

Gary led this part of the discussion by indicating that he had been in discussions with the DWS Center concerning the cost of testing bag and cartridge filters and the high cost of challenge testing with *Cryptosporidium*. The market for these types of systems is small utilities who do not have a lot of money to test these systems, as the number of challenge tests required increase, and the manufacturers do not want to put a lot of money into testing because of the risk of not recovering the money used for testing. Another issue that Gary brought to the attention of the group concerns when the LT2 rule applies. He feels that the use of bag and cartridge filters is applicable to remove *Crypto* on pristine waters, where there are not a lot of pollutants and other contaminants. If these bag and cartridge filters are used in only those situations, than the LT2 rule is not going to apply and he is wondering if the ETV protocol even needs to harmonize with the LT2 rule. Steve suggested another application for bag and cartridge filters can be as a polishing step in larger systems. Glen Latimer added that many bag and cartridge filters are eliminated in the pilot phase because of the high O&M involved. Joe and Steve agreed that testing under LT2 guidance would allow a larger system to use bag and cartridge filters in line as a polishing step. ***Kevin Brown suggested that the DWS Center work with the bag and cartridge filter industry to further develop the ETV protocol.***

Bruce then suggested that the ETV protocol could indicate that the protocol is designed for bag and cartridge systems intended for small systems and/or for a certain water quality. The DWS Center will continue to work with Steve Allgeier and the EPA, and could add a section into the ETV protocol for additional testing that would be required if specifically testing to harmonize with LT2. Bruce reiterated that if a system was heading toward a water quality where LT2 would apply, bag and cartridge systems would probably not be recommended as the primary system, but as a polishing step. Gary stated that input from the states is very important to know because they are people that ultimately make the decision as to whether these types of systems are used or not. James Weiss indicated that Alaska's waters are considered pristine; however, there is not one surface water that has not tested positive for *Cryptosporidium* with some seasonal variation. Alaska tends toward the reasoning that bag and cartridge filters are the most affordable option. The University of Alaska is going to be doing some testing that includes a bag and cartridge filter with the DWS Center. Robert Mann indicated that New Hampshire does not consider bag and cartridge filters for serious water quality problems. Engineers in his state have a negative impression of them and are not used. Kristie reiterated that maybe the DWS Center could use a two phase testing approach where additional testing would be required if the manufacturer wanted to test to adhere to the LT2 guidance. ***Bruce and Steve suggested a follow-up conference call with all interested parties and to get state recommendations about testing and using bag and cartridge filters.***

Survey of 4 Ultraviolet (UV) Radiation Testing Protocols, including ETV DWS Center, ETV Source Water Protection Center, Nation Water Research Institute (NWRI), and the USEPA Draft Guidance  
Bruce explained that the DWS Center is in the process of harmonizing the various protocols that exist. Bruce also said that the ETV DWS protocol for evaluating UV systems is the only document that he knows that has full support of the drinking water stakeholders. The DWS Center is working with a consultant to try to harmonize the UV protocols. ***Do the stakeholders want the DWS Center to continue to pursue this task? Should we find funds if the proposal submitted to the New York State Energy Research and Development Authority (NYSERDA) does not go through? How important is this task; is it important to harmonize the ETV protocol with LT2?***



Robert Mann asked if there is a cost savings to the vendor to have the different types of protocols harmonized. Bruce replied that yes, there would be a cost savings if a vendor wants to be verified for both water reuse and drinking water; this could allow for reduced testing to cover all of the different testing requirements. Gordon inquired if there is a trade organization for UV manufacturers that exists. Glen Latimer said that UV manufacturers would probably be members of the American Water Works Association (AWWA) or the Water Quality Association (WQA). Bruce reiterated that the documents are not too different from one another; the protocols just need to be brought all together to prioritize the testing requirements and reduce the confusion from manufacturers as to what testing protocol they should test against. Last November, OGWDW came out with new guidance that did not reference two of the existing protocols, the DWS Protocol or the NWRI protocol; it only referenced the German standard in the appendix. Jerry Lane added that it would make sense to recommend the ETV protocols to OGWDW since they already exist and have been tested against. Bruce asked if everyone agreed to the approach of harmonizing the UV protocols and everyone did. Bruce also indicated the importance of getting the industry to back this approach and that it is important to formally present our protocols and recommendations to the EPA. The group also agreed to a proposal for vendors to assist in the funding of any harmonization of UV protocols. Teresa added that having industry representatives would be very credible. ***Bruce indicated that the DWS Center will follow up with a conference call with UV stakeholders and industry representative to go over this issue.***

12:30-1:15 PM – LUNCH

#### **Percent power guidelines in test plan for UV technologies**

Bruce Bartley presented a comment brought to the DWS Center's attention by a stakeholder concerning the specified lamp power in the test plan. Currently the test plan does not outline the percent power that a unit needs to run at for verification testing. It was agreed upon to leave as is to leave the option open to the manufacturer as to what percent power to verify the system at.

#### **Modification of Disinfection By-Product Precursor (DBPP) Removal Protocol Membrane Test Plan to include Natural Organic Material (NOM) humic and fulvic acid characterization**

(Section 6.3 – please see additional information attached for this section)

Kristie Wilhelm presented a comment brought to the DWS Center's attention to add NOM analyses to the membrane protocol. Comments from the test plan writer and FTO include that Pyrolysis-GC/MS is difficult, costly, time consuming, and only semi-quantitative; they would recommend adding more TOC, DOC, and UVA analyses; and that molecular weight (MW) size distribution would be helpful to characterize the water. Kristie asked the group whether apparent MW size distribution should be added as a water quality characterization task. Should it be optional or required?

David Pearson added that some locations where they have installed systems have water that have reacted differently to their membranes, and was attributed to differences in NOM not DOC. He added that the ETV protocol does not provide enough information to fully characterize the water. Joe Jacangelo said that MW is not done commercially; it is done at universities and may not have the quality assurance data that is required by ETV. The stakeholder group decided to add to the test plan that apparent MW size distribution is strongly recommended.

#### **Consistency on power usage measurement requirement**

Angela Beach presented a comment brought to the DWS Center's attention to revise the language on power usage measurement requirements to make consistent throughout all of the test plans. Bruce Bartley

recommended that the DWS Center consult with Joe and Gary about composing some language to be consistent throughout all of the test plans.

### **Change in the “ballot” systems for Steering Committee Voting**

Bruce Bartley presented an issue concerning the voting procedures used by the DWS Center. Currently, the DWS Center requires two-thirds of the SC to vote positively for each ballot item for the item to be passed. The ETV Program does not provide guidance on this and the DWS Center is willing to change its procedures to prevent logjams. The group agreed upon a shortened turnaround time, of three weeks, with a reminder one week before the ballot's due date to those who have not voted at that time. The Center will still require a 2/3 decision by the ballots received. Voting by proxy is welcomed. All mailings/e-mailings will clearly indicate that the document is an “ETV Ballot”. The Center will also look into e-balloting (email and web based balloting) for the Steering Committee.

### **Arsenic Technology Testing**

#### **Update on Arsenic Removal Testing in Pennsylvania and Alaska**

Angela Beach presented the status of the three small system arsenic removal projects with adsorptive media technologies in Pennsylvania. The development of the first PSTP is currently in progress with testing to tentatively begin in December of 2002. The PA DEP is jointly funding this project with the DWS Center.

Glen Latimer asked if Phil Consinary's group in PA was involved in the project for the state's compliance inspections. Glen suggested talking to them as a resource in the project. Mr. Consinary has not been involved in the PA projects; the Center will look into his involvement. Jeff Adams brought up the fact that these projects are not being run with the traditional 30-day test period; these systems will be run until breakthrough. Jeff suggested that Bruce talk about how rapid small-scale column tests (RSSCT) were previously discussed as part of the projects. Bruce explained that originally, these verifications tests were going to be presented as two phases for verification; the first to be based on RSSCT work to estimate the time to breakthrough, the second to be based on the actual field tests run through breakthrough. Some media is iron coated and cannot be ground, as would be required for RSSCTs. The EPA decided that the DWS Center should not explore RSSCT at this time; AWWARF and other research groups are looking into these types of tests.

Bruce also explained that since the vendors have indicated that their systems may run for 10 to even 15 months, the verifications will essentially be in two phases: the first phase involving the initial 2-week integrity test and the second phase involving running the capacity test until breakthrough. In addition, the state of PA is requiring that the water not go to waste due to a drought in the state and consequently, the systems had to go through Standard 61 certification. Pat Cook indicated that he was familiar with an adsorptive media system in MI, just north of Ann Arbor, that has been running for 5 years and has not yet reached breakthrough.

Jeff then asked for input on a 2-phase report and whether running a system through breakthrough is important (because so site specific) verses just collected O&M information for 30 days. Both James Weise and Glen Latimer agreed that generally knowing how long a media will last through breakthrough is important and can be extrapolated to other sites. Glen also said that the question that everyone always asks about media is concerning how long will it last and how dispose of it. Gary Logsdon asked if any of these types of systems go through a backwashing step and Pat Cook indicated that most go through a ‘fluffing’ process about every 30 days. Glen added that these media act like a filter to many other contaminants in the water, not just arsenic, and need to be backwashed to remove particulates.

Bob Mann asked if the other EPA demonstration was involved in these tests and Jeff replied no, that Tom Sorg's project has its own funding to test full-scale systems in a research oriented setting. Tom's project is running independently; however, the DWS Center is trying to work out a coordinated test plan so that ETV verification reports could possibly be produced from Tom Sorg's demonstration. At this point, the request for technologies has been put out and proposals should be in by the first of year.

Bob then asked if the tests in PA were being run side by side and if the vendors had problems with the comparative nature of doing that. Bruce replied that each system is being run at different sites where we tried to match up the appropriate technology with the water quality found at each site.

The group agreed that a two-phase report process be used for these tests: 1<sup>st</sup> phase – Integrity Test, 2<sup>nd</sup> phase – Capacity Test/O&M. Each report will clearly indicate what phase(s) the report contains. Bill Allis inquired about arsenic spiking to speed up the breakthrough point and Bruce explained that he would prefer not to. Angela Beach also explained that spiking the water would not give the true water quality conditions as found at the site. Bruce suggested discussing spiking with Tom Franklin of PA DEP.

Kristie Wilhelm presented the status of the two arsenic removal projects to be conducted in Alaska with the FTO, University of Alaska, Anchorage (UAA). UAA is currently looking into a potential site near Wasilla, AK that has a small community with about 10-20 connections. The two potential manufacturers are Delta Environmental, with an ozone filtration system, and Eaglebrook, with a polymer enhanced coagulation/filtration system. The PSTP for the Delta unit is expected this month. Funding for these projects involve each manufacturer, UAA Technology Technical Assistance Center (TTAC), ETV, and Alaska Department of Environmental Conservation.

#### **Should the Center develop a TSTP for oxidation systems that oxidize iron and remove arsenic through co-precipitation?**

Kristie then explained that the DWS Center does not have a TSTP specifically for systems that use existing iron to remove arsenic through co-precipitation. Gary Logsdon offered the comment that the Center could use the existing coagulation/filtration TSTP for ozone filtration systems as long as the test measures the exact level of arsenic in the feed water as well as the iron "dose". James Weise explained that they were involved in testing a field test kit to measure arsenic and needed to correlate the measured arsenic levels found in the field verses measure in the lab to compensate for the low temperatures found in AK. The DWS Center will ballot the Steering Committee on referencing the coagulation/filtration TSTP for oxidation filtration systems for the removal of arsenic.

#### **What analyses should be required for arsenic media disposal: Total Arsenic by ICP-MS analyses, TCLP and/or California WET? Arsenic residuals disposal issues**

Bruce Bartley presented this issue to the group. The discussion centered on whether both analyses were needed. Glen Latimer was concerned that some research suggested that no waste solids including media would pass the Ca WET and that this information should be collected. The group decided to require both TCLP and Ca WET for all arsenic technologies that produce waste. The DWS Center will look into having the technical writer add this step to Chapter 1 of the Arsenic Removal Protocol.

#### **Product Change Policy**

(Section 8. – please see additional information attached for this section)

Bruce presented the issue of manufacturers making critical design changes to their product that can materially affect performance. Currently, the DWS Center relies on vendor self notification and regulatory/competitor notification. The ETV Program is currently considering policies on managing changes to ETV verified products. Bruce presented the following questions to the group:

- Is the present policy adequate?

- Should the Center be more proactive?
- Is this a concern to stakeholders? What is the concern?
- Input requested: What is best way to manage product changes that could materially affect performance?

Jerry Biberstine added that from a state's perspective, the states and manufacturers already have to discuss and work out scaling issues. Glen suggested a requirement to check all printed advertisements (e.g. magazine ads) to follow up on any design changes. Joe Jacangelo said that a dealer would know of a product change concerning the materials or design configuration if you called them and asked for that information. Herald Fravel suggested sending an affidavit to the manufacturers to assess any changes. In some cases, changes have been made to a product where they did not change the name. He also asked what determines a significant change. Bruce added that some ETV Centers have expiration dates on their reports, for those verifications that are cheaper and quicker, and for technologies that are routinely tweaked and updated.

Another comment that was made by the group was that some changes are made (e.g. pipe, minor hardware, etc.) that do not necessarily change the "process". Buck Henderson said that some changes could be made to "improve" the process, but not necessarily to "change" the process. He also suggested making a list of acceptable changes so that a manufacturer can be clear of what changes are found critical design changes and what changes would not be. Herald Fravel suggested sending a reminder to the manufacturers to the regulatory representative within the manufacturer, to initiate a check of any design changes. Bruce also explained that if an RO membrane were also NSF certified, there would already be a design change mechanism in place. ***Bruce said that the DWS Center could work with technology experts to develop lists of acceptable and non-acceptable design changes.*** Mark Jost added that certification does not test system performance, only health effects of the components of the system. The factors to determine health effects are different than what ETV looks at for performance. He is not comfortable with self-policing; there is nothing in place to ensure performance with a new and improved product. Bill Allis asked if the DWS Center has had to deal with company name changes. At this time, this issue has not been a factor. Robert Mann added if a section to the Verification Statement could be added specifying any changes. Bruce responded that there is still any issue of the overhead cost to review and assess any data or product change information. It was decided upon by the group to maintain the self-policing policy with a yearly affidavit to each vendor to initiate a product review by the vendor.

### **Existing Data Policy**

It was decided to table this topic by conducting a conference call with interested parties.

### **Miscellaneous**

A comment was made to continue to coordinate the DWS Center meetings with the WQP Center. Having the meetings together in succession helped the states' representatives that are involved in both Centers make travel arrangements.

The DWS Center is tentatively planning the next annual Stakeholder Meeting for November 2003 in Ann Arbor, Michigan or Cincinnati, Ohio.

The DWS Center would like to thank all of the participants that attended the annual meeting; we look forward to any other comments and feedback from its stakeholders.

MEETING ADJOURNED AT APPROXIMATELY 3:30PM

**EPA/NSF ETV Drinking Water Systems Center  
Annual Stakeholder Meeting  
November 19<sup>th</sup>, 2002  
Agenda**

**8:00-8:30 AM Continental Breakfast**

**8:30-8:45 AM Introductions (1.) Kevin Brown, Chair**

Antitrust Statement and Housekeeping Items (1.1) **Bruce Bartley, NSF**

Welcome & Introductions (1.2) **Kevin Brown, Chair**  
Farewell to Those Departing (1.3)

**8:45-9:15 AM ETV Program Update (2.) Teresa Harten, ETV Program Director, EPA**

**9:15-9:30 AM ETV Drinking Water Systems Center Overview (3.) Bruce Bartley, NSF**  
Scope, Mission, and Purpose (3.1)

**9:30-9:45 AM ETV Drinking Water Systems Center Update (4.)**  
Verification Testing Status (4.1) **Kristie Wilhelm, NSF**  
Protocol and Test Plan Status (4.2) **Angela Beach, NSF**

**9:45-10:00 AM Future Water Security Projects (7.) Bruce Bartley, NSF**  
Progress (7.1)  
For Future Funding Consideration (7.2)

**10:00-10:30 AM Protocol Developments and Modifications (6.)**  
Harmonization of ETV Protocols with the Enhanced Surface Water Treatment Rule-Long Term 2 (LT2) (6.2)  
Modification of the *ETV Test Plan for Membrane Filtration for Particulate and Microbial Reduction* to include laboratory bench scale testing for microbial removal (6.2.1) **Steve Allgeier, US EPA**  
**Joe Jacangelo, MWH**

**10:30-10:45 AM BREAK**

**10:45-12:00 PM** (Continuation of previous discussion)  
Modification of the *ETV Test Plan for Bag and Cartridge Filtration for Particulate and Microbial Reduction* to include laboratory testing with radiolabeled microspheres (6.2.2) **Steve Allgeier, US EPA**  
**Kristie Wilhelm, NSF**  
**Gary Logsdon, Black and Veatch**

Survey of 4 Ultraviolet (UV) Radiation Testing Protocols, including ETV DWS Center, ETV Source Water Protection Center, National Water Research Institute (NWRI), and the USEPA Draft Guidance (6.2.3) **Bruce Bartley, NSF**

Percent power guidelines in test plan for UV technologies (6.5) **Bruce Bartley, NSF**

<b>12:00-12:15 PM</b>	Modification of Disinfection By-Product Precursor (DBPP) Removal Protocol Membrane Test Plan to include Natural Organic Material (NOM) humic and fulvic acid characterization (6.3)	<b>Kristie Wilhelm, NSF</b>
<b>12:15-12:30 PM</b>	Consistency on power usage measurement requirement (6.4)	<b>Angela Beach, NSF</b>
<b>12:30-1:30 PM</b>	<b>LUNCH</b>	
<b>1:30-1:45 PM</b>	Change in the “ballot” systems for Steering Committee Voting (6.1)	<b>Bruce Bartley, NSF</b>
<b>1:45-2:45 PM</b>	<b>Arsenic Technology Testing (5.)</b> Update on Arsenic Removal Testing in Pennsylvania and Alaska (5.1)	<b>Angela Beach, NSF</b> <b>Kristie Wilhelm, NSF</b>
	Should the Center develop a TSTP for oxidation systems that oxidize iron and remove arsenic through co-precipitation? (5.2)	<b>Bruce Bartley, NSF</b>
	What analyses should be required for arsenic media disposal: Total Arsenic by ICP-MS analyses, TCLP and/or California WET? Arsenic residuals disposal issues (5.3)	<b>Bruce Bartley, NSF</b>
<b>2:45-3:30 PM</b>	<b>Product Change Policy (8.)**</b>	<b>Bruce Bartley, NSF</b>
<b>3:30 PM</b>	<b>ADJOURN</b>	

**\*\* New Agenda Item**



## EPA's Environmental Technology Verification Program

### Stakeholders Update

November, 2002

## NACEPT - January 2002

(National Advisory Council for Environmental Policy and Technology)

### Recommendation:

- ❖ The EPA should continue to identify and bring to market the best practices and cost-effective environmental technologies by **expanding** its Environmental Technology Verification (ETV) Program.



## ETV

### Objective

- Provide credible performance data for **commercial-ready environmental technologies** to aid vendors in selling innovative technologies, purchasers in making decisions to purchase innovative technologies, and permittees in making permitting decisions regarding environmental technologies.

### Approach

- Public private partnerships** for business efficiency and 3rd-party, objective testing
- Broad-based **stakeholder** process helps choose technologies and develop testing protocols
- Verify (evaluate)** performance; no winners or certification
- Quality assurance** at all program levels
- EPA oversight** to ensure science relevance, fairness, consistency across partner organizations
- Commitment to **outreach** - website and other means



## Current ETV Program

- ETV Air Pollution Control Technology Center  
*Research Triangle Institute*
- ETV Drinking Water Systems Center  
*NSF International*
- ETV Greenhouse Gas Technology Center  
*Southern Research Institute*
- ETV Advanced Monitoring Systems Center  
*Battelle*
- ETV Water Quality Protection Center  
*NSF International*
- ETV - Building Decontamination Center  
*Battelle*
- ETV P2 Coatings and Coating Equipment Pilot thru 2003  
*Concurrent Technologies Corporation*

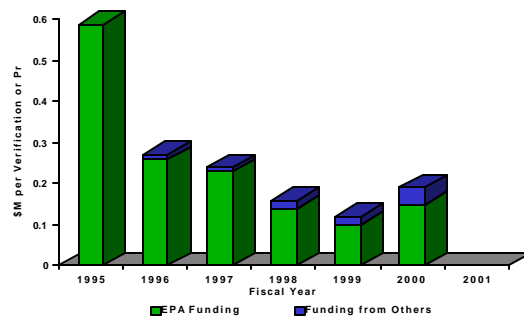


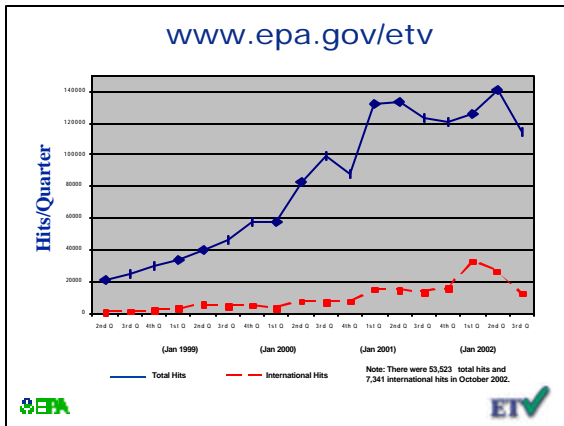
## ETV Successes through September 2002

- 194 Verifications, 72 protocols to date
- Vendor demand continues – 94 technologies in testing/evaluation, 135 applications pending
- Increasing funding from vendors and others
- 1,225 Stakeholders in 18 groups
- Commendations from National Advisory Council for Environmental Policy and Technology (NACEPT) and EPA Science Advisory Board (SAB)
- Supports regulatory and voluntary Agency and State programs
- Growing international interest
- New role in homeland security verifications



## ETV Cost Efficiency





### Challenges

- Funding, partnering to meet demand/need
- Expanding into **new centers** including homeland security, P2, water infrastructure, etc.
- Addressing the SAB recommendation for **increased scope** of verifications while **controlling cost and time to verify**
- Policing vendor **use of verification** information
- Coordinating with the **international community**
- Monitoring and assessing program **impact and outcomes**

### ETV International - 2002/2003

- Visits from Thais, Japanese in 2002
- Video conferencing to attend Dec 2002 WHO sponsored conference on arsenic in DW treatment in India
- Give keynote at meeting on verification in Japan, February 2003.
- Proposal to OAR/World Summit Sustainable Development on indoor air and cookstoves, other WSSD opportunities
- Fifteen vendors from outside US verified in 2002 or currently being verified
- International website hits are stable at about 10% of total hits, and track overall use trends.

### Getting to ETV Outcomes

Measuring outputs to outcomes

Outputs

Outcomes

- Number of protocols and verifications
- Value placed on ETV by vendors
- **Amount valuable information to potential purchasers; influence of ETV on purchase decisions**
- **Use of better technologies; reduced emissions because of ETV**
- Reduced exposure; reduced risk because of ETV
- Improved health/environmental quality because of ETV

### ETV Future

- Environmental technology performance verification is central to EPA mission
- Need exists for additional verification areas
- Challenges remain

### Outcomes: Vendors

- **ETV and Vendors** - ask vendors to provide ETV with estimates of sales impact of ETV for products
  - ✦ Initially send vendor survey with cover letter to all verified vendors; provide them a range increase sales (no impact; 0-20%; 20-40%; 40-60% etc.) to check off, other questions as determined by consultant and team
    - Repeat annually for five yrs?
    - Would they do it?
    - Who should send it EPA, partner, or contractor?
    - Would it have chilling effect on vendor participation?



## Outcomes: Purchasers

- **ETV in purchase decisions** – how are purchasers of environmental technology using ETV info?
  - ✦ OMB survey approval needed
  - ✦ ask vendors for info on purchases; purchasers mail list – to be kept confidential and any results to be shown as composite.
  - ✦ Require vendors to give to customers, potential customers
    - Would they do it?
    - Who should author it EPA, partner, or contractor?
    - Would it have chilling effect on vendor participation?



## Cost sharing FY 2003 funds and beyond

- **30% cost share from others for total ETV is target in RTC for 2003 to 2006**
  - ✦ full privatization is what creators of ETV expected.
  - ✦ if "overhead" is 1/2 of costs, then to get to 30% (from 17% in 2001), ETV needs to increase verification cost share to 60% from others on average.
  - ✦ help in cost sharing for protocols is being considered
  - ✦ concern for fairness and loss of access to small companies if vendor share increases significantly. Result: purchasers won't get info needed on full range of technologies
- **Consider 2 or more tier cost share structure**
  - ✦ 2 tier: small and large or 3 tier: very small, small and large?
  - ✦ foreign and US
  - ✦ first round and later rounds
  - ✦ others ??



## New role ETV-Homeland Security

- Rapid verification process
- Builds on existing centers with one new center
- Exploring collaborations with existing HS centers within government

Existing ETV Centers	Water Security	Safe Buildings
Advanced Monitoring	✓	✓
Air Pollution Control Tech.		✓
Water Quality Protection	✓	
Drinking Water Systems	✓	
New Building Decontamination		✓



## SBIR definition of small business

- **Small business - less than 500 employees**
  - ✦ Encourage self policing of vendors to help with accuracy, veracity

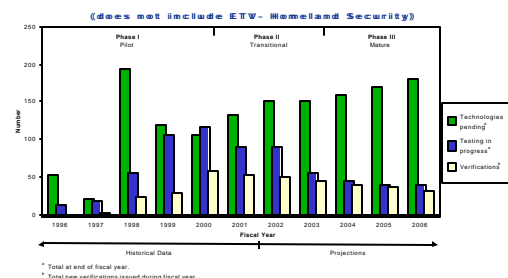


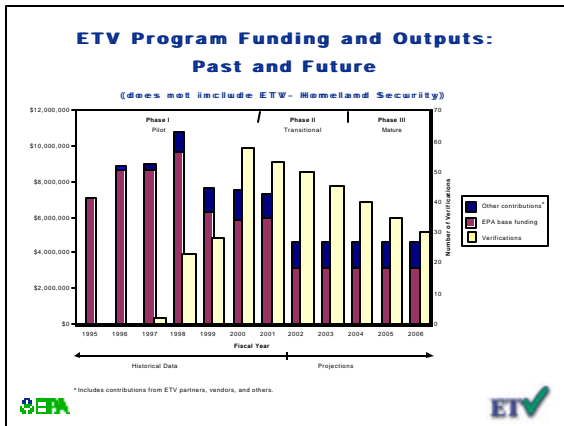
## Science Advisory Board Reviews ETV

- **SAB Commentary (2001) Recommended:**
  - ✦ Comparisons of verified products
    - ETV response – don't compare but improve comparability
  - ✦ Increase verification scope to include O&M, longer term testing, life cycle costs, more factors
    - ETV response – agree, but consider costs
  - ✦ Increase proportion of stakeholders from environmental groups, financiers, and underwriters
    - ETV response - agree



## Demand for ETV Verification: Past and Future





## Environmental Technology Verification (ETV) Drinking Water Systems (DWS) Center

### STAKEHOLDER MEETING

Ann Arbor, Michigan  
November 19, 2002

EPA



## ETV DWS Center Overview

- Cooperatively managed by EPA and NSF
- Independent performance evaluations to facilitate alternative treatment technologies into market
- Treatment technologies address contaminants with potential public health impact
- Commercially-ready units, i.e. R&D completed, products, NOT technology categories

EPA



## ETV DWS Center Scope and Mission

- Verify performance of drinking water technologies
- Emphasis on small system needs
- Stakeholders: states, vendors, EPA, consultants, and small systems

EPA



## ETV DWS Center Unique Characteristics

- No pass-fail criteria; not a certification.
- Testing often conducted in the field.
- Products are pre-engineered skid mounted equipment and components.
- Extensive Quality Assurance oversight and review by NSF and the EPA.

EPA



## ETV Drinking Water History

- The Pilot Phase – 1995 - 2000
- Transition to the Center
- Center phase established in 2000
- Key decisions, milestones & developments

EPA



## ETV Drinking Water History – Pilot Phase

- All states for review protocols: goal to reduce redundant testing
- Existing Data and O&M
- Cost effective protocols & test plans
- Enhanced Quality from lessons learned
- Numerous reports & protocols issued
- Cost share: 75% ETV and 25% others

EPA



## ETV Drinking Water History – Center

- **Protocols**
  - Harmonization with LT2
  - Validation & upgrades – existing
  - New = rarely developed
- **Testing:**
  - EPA priorities
  - Market sustainability; Privatization & partnerships; no match except As & Security
  - Cost effective protocols & test plans revisited
- **Quality: SAB Data Quality Objectives**

EPA



## ETV Drinking Water Center: Future Challenges

- **Small system technology verifications:**
  - Important to EPA OGWDW (compliance)
  - High testing cost vs. low cost technologies for small systems = few participants
- **Interest in ETV by Innovators but no funds for new protocol development:**
  - Electro –coagulation, Ultrasound, Acoustic Energy
  - Membrane Distillation, Biological Precipitation

EPA



## Verification Testing Status

- 27 Verification reports published
- 4 Most recent (since October 2001)
  - 2 Ultraviolet Radiation Technologies
  - 1 Ozone Disinfection System
  - 1 Microfiltration System
- 8 Verifications in progress
  - 2 testing completed in reporting phase
  - 1 preparing to test
  - 1 Product Specific Test Plan under NSF review
  - 4 Product Specific Test Plans under preparation

EPA



## Protocol and Test Plan Status

- Total updates and revisions = 29 (8 Protocols & 21 Test Plans)
- Revisions in progress = 4
- New TPs planned for 03:
  - Adsorptive Media for SOC Removal
  - Adsorptive Media for VOC Removal
- TP Revisions planned for 03:
  - Adsorptive Media for As Removal
  - UF/MF Membranes
  - Bag and Cartridge

EPA



## ETV DWS Center Water Security

- **Present funding: Residential POU testing**
  - CDC report on Milwaukee *Crypto*
  - Additional barrier of protection
- **Technical Advisory Panel: experts from CDC, DOD, Utilities**
- **Technologies: 1<sup>st</sup> barrier systems, 2<sup>nd</sup> chemical barriers, 3<sup>rd</sup> others as funds allow**
- **Fast Track Reporting: ETV report cites the PSTP in Appendix and exceptions**

EPA



## ETV DWS Center Water Security Future?

- **Vulnerability reduction technologies, e.g. On-site generation disinfectant**
- **Package plants: Temporarily produce DW while system decontaminated**
- **Decontamination technologies – ETV Water Quality Protection Center**
- **Requesting suggestions from DWS Stakeholders**

EPA



### DBPP Protocol Modification

- Add Natural Organic Material (NOM) analyses to Membrane Protocol?
- Comments from test plan writer and FTO:
  - Pyrolysis-GC/MS is difficult, costly, time consuming, and only semi-quantitative.
  - Add more TOC/DOC/UVA.
  - MW size distribution helpful to characterize water.
- Question: Should apparent MW size distribution be added as water quality characterization task? Optional? Required?

EPA



### Bag and Cartridge Test Plan Modifications

- ETV Center Objectives:
  - Alleviate water security issues inherent with using microorganisms or surrogates at utilities;
  - Harmonize with the LT2 Guidance; and
  - Reduce cost of challenge testing.

EPA



### Bag and Cartridge Test Plan Modifications (cont'd)

- Current ETV Test Plan requires:
  - Initial test with 3 filters same lot and 3 filters from 3 different lots. Turbidity and particle counts.
  - Thirty (30) day test in the field.
  - Field challenges with *Crypto* or microspheres.
    - Occur at 0%, 50% and 90% headloss.
    - At least 9 effluent samples.

EPA



### Bag and Cartridge Test Plan Modifications (cont'd)

- Draft Preamble to the LT2 Rule requires:
  - Microbial or surrogate challenge testing on numerous filters (up to 20 filters considered).
  - Challenge tests at 0%, 50% and >100% headloss.
  - Testing could involve 3 times the number of filters as in the ETV Test Plan.

EPA



### Bag and Cartridge Test Plan Modifications (cont'd)

- ETV Center Proposes:
  - Challenge tests in Laboratory.
  - Challenge tests with *Crypto* or microspheres:
    - 4 filters same lot;
    - 1 filter from each of 8 different lots;
    - total of 12 filters tested.
  - Run the challenges ONLY at start up (approx. zero headloss) to establish lot to lot variability.

EPA



### Bag and Cartridge Test Plan Modifications (cont'd)

- ETV Center Proposes:
  - Require characterization of water quality - particle counts and turbidity.
  - 30-day test in the field [Question for state regulators: Is 30 days the right amount of time and how many filter changes are enough?]
    - Turbidity, particle counts, and pressure readings with on-line instrumentation.
  - On-line particle count data used to establish log removal credit.

EPA



### Bag and Cartridge Test Plan Modifications (cont'd)

- EPA response/concerns:
  - Laboratory challenge testing is consistent with LT2 language.
  - Use of field particle count data for log removal credit not allowed under proposed LT2.
    - Suggested that a study and extensive amount of data are necessary to establish correlation between *Crypto* removal and particle removal.
    - Suggested that variability in particle characteristics in natural waters may be such that one would need to perform a direct verification that particle counts were conservative for each challenge test.

EPA



### Bag and Cartridge Test Plan Modifications (cont'd)

- Feedback - State agencies indicated particle counts are used to establish log removal credits for alt. treatment technologies.
- Open up the discussion to all Stakeholders.

EPA



### ETV Testing in Pennsylvania

- Contaminant of Concern: Arsenic
- Technology Focus: Adsorptive Media
- FTO: Gannett Fleming
- 4 participating vendors at 3 sites:
  - Kinetico Inc./Alcan Inc. at Shermansdale
  - ADI International Inc. at Hilltown Township
  - Water Remediation Technology, LLC (WRT) at Sellersville
- Development of first PSTP in progress
- Testing to begin Dec 02

EPA



### ETV Testing in Alaska

- Contaminant of Concern: Arsenic
- FTO: University of Alaska, Anchorage
- Potential site near Wasilla, AK
  - Small community with 10-20 connections
- 2 Potential manufacturers:
  - Ozone filtration system from Delta Environmental Industries
  - Polymer enhanced coagulation/filtration system from Eaglebrook
- PSTP expected this month for Delta unit

EPA



### Product Change Policy

- Issue: critical product change that materially affects performance
  - vendor self notification
  - regulatory or competitor notification
- ETV Program is presently considering policies on managing changes to ETV verified products

EPA



### Product Change Policy

- Is the present policy adequate?
- More pro-active?
- Is this a concern to stakeholders? what is the concern?
- Input requested: how to best manage product changes that could materially affect performance

EPA



## Membrane Filtration for Pathogen Removal under LT2ESWTR

Steven C. Allgeier  
United States Environmental Protection Agency  
Office of Ground Water and Drinking Water  
Cincinnati, OH

## LT2 Membranes What is EPA proposing?

- Rule to cover MF, UF, NF, and RO.
- Removal efficiency established through challenge testing and direct integrity testing.
- Periodic direct integrity testing and continuous indirect integrity monitoring during use.

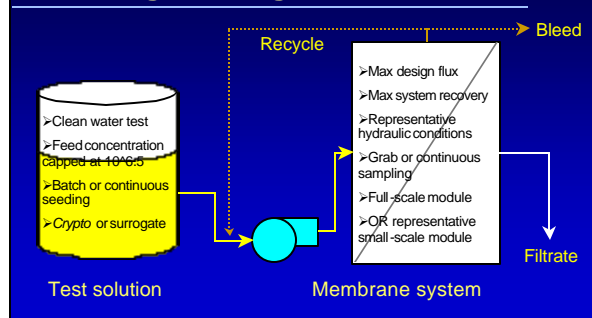
## Membrane Filtration under LT2

- Regulatory definition of membrane filtration:
  - ⇒ Pressure or vacuum driven separation process.
  - ⇒ Removes particles  $> 1 \mu\text{m}$  by size exclusion.
  - ⇒ Can be direct integrity tested.
  - ⇒ Includes MF, UF, NF, and RO.
- Product specific challenge testing for *Crypto*.
- Periodic direct integrity testing to verify removal efficiency at the level awarded to the process.
- Continuous indirect integrity monitoring between direct integrity tests.

## Framework for Removal Credits

- Potential removal credit up to 5.5 log.
- Potential "stand-alone" technology.
- Maximum credit is the lower value of either:
  - ⇒ Removal efficiency demonstrated during challenge testing,
  - ⇒ **OR** maximum log removal value that can be verified through direct integrity testing.
- Credit for existing membrane plants:
  - ⇒ Determined by primacy agency under LT1/IESWTR,
  - ⇒ **OR** based on LT2ESWTR criteria.

## Challenge Testing

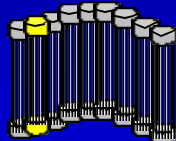


## How to Select a Surrogate?

- Direct comparison of surrogate with *Crypto*.
- Identify characteristics of a conservative surrogate:
  - ⇒ Size distribution conservative for *Crypto* ( $< 1 \mu\text{m}$ ).
  - ⇒ Dispersed in solution (no clumping or attachment).
  - ⇒ No significant charge.
  - ⇒ Discretely quantifiable.
- Examples of potential surrogates:
  - ⇒ Microbial – *Bacillus subtilis*, *Serratia marcescens*.
  - ⇒ Particulate – polystyrene microspheres.
  - ⇒ Molecular – dyes, organic macromolecules.

## The Challenge of Product Variability

- ❑ No requirement to test a specific # of modules.
- ❑ Must verify performance of modules not tested.
- ❑ Nondestructive performance test and control limit applied to production modules.
- ❑ Test conservative modules during challenge test.



## Summary

- ❑ The LT2ESWTR is an opportunity to properly address membrane filtration in the federal regs.
- ❑ Higher removal credit may be awarded to membrane processes based on performance.
- ❑ Challenge testing demonstrates the removal efficiency of an integral membrane.
- ❑ Direct integrity testing verifies removal efficiency at a level commensurate with removal credit.
- ❑ Continuous monitoring provides some indication of process performance between integrity tests.

## For More Information ...

[www.epa.gov/safewater/mdbp/mdbp.html](http://www.epa.gov/safewater/mdbp/mdbp.html)

- ❑ Long Term 2 Enhanced Surface Water Treatment Rule.
- ❑ Stage 2 Disinfectants & Disinfection Byproducts Rule.
- ❑ Ground Water Rule.
- ❑ Draft *Guidance Manual for Membrane Filtration ...*  
⇒ Coming soon!



## Bench-Scale Protocol for Microbial Characterization of Low-Pressure Membranes

Joseph G. Jacangelo, MWH

USEPA / NSF ETV Steering Committee Meeting

Ann Arbor, Michigan  
November 19, 2002



## Salient Features of Current ETV Protocol for Membrane Testing

- Written to evaluate membranes at pilot scale
- Requires testing of membrane module similar to full-scale unit
- Requires in the field operational data collection
- Requires in the water quality data collection
- Microbial challenge studies are an optional task

## Why a Bench-Scale Membrane Testing Protocol?

Bringing microorganisms on-site for seeding at pilot scale becoming less acceptable

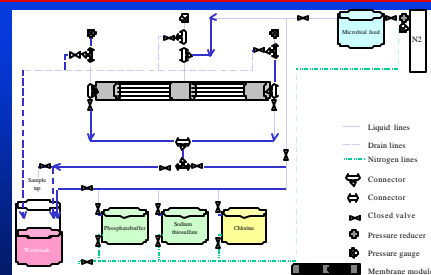
- Increased sensitivity after September 11
- Use of non-pathogenic organisms, attenuated organisms or inactivated organisms are often NOT acceptable, even in the absence of a being public health hazard

## Key Aspects of Bench-Scale Membrane Testing Protocol

- Low-pressure membrane testing unit easy to construct and operate
- Accommodates many types of membranes
- Reduces microbial seeding costs as compared to pilot-scale experiments
- Reduces time to conduct experiments
- Tests true removal capabilities of membranes
- Harmonizes with USEPA Long-Term 2 Enhanced Surface Water Treatment Rule Guidance Manual

## Overview of Protocol

## Bench-Scale, Low-Pressure Membrane Testing Unit Employed in Study



### Membrane Fibers



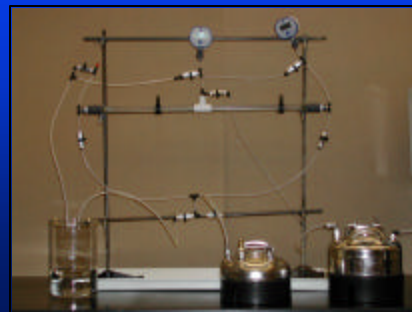
### Fibers in Module



### Bench Module



### Low Pressure Membrane Testing Unit



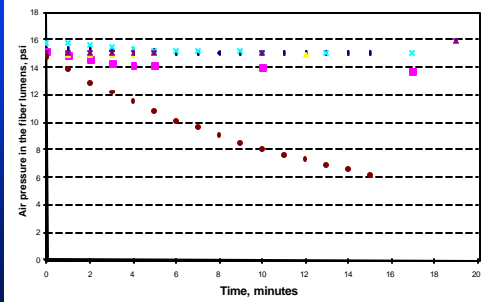
### Partial List of Microorganisms Employed in Protocol

Organism	Approximate size, um
Protozoa	
<i>Cryptosporidium</i>	3 - 7
Bacteria	
<i>Escherichia coli</i>	0.5 - 3
<i>Pseudomonas diminuta</i>	0.3-0.4 x 0.6 -1
Virus	
MS2 bacteriophage	0.024
hepatitis A virus	0.025
calicivirus	0.027
PRD1 bacteriophage	0.07

### Microbial Challenge Protocol

- 1) Break-in module with 0.1 mM phosphate buffer (pH 7) after membrane fully wetted for 8 hours
- 2) Perform membrane integrity test

#### Air Pressure Decay Test on Low-Pressure Membrane Testing Unit Module



#### Microbial Challenge Experiments

- 1) Break-in module with 0.1 mM phosphate buffer (pH 7) after membrane fully wetted for 8 hours
- 2) Perform membrane integrity test
- 3) Set transmembrane flux; determine specific flux
- 4) Perform microbial challenge test; sample after 5 HRT's
- 5) Determine specific flux
- 6) Perform second membrane integrity test
- 7) Perform chemical cleaning / disinfection of module
- 8) Perform next experiment

## What the protocol is and is not

#### What the Protocol Is

- A measure of the removal capability of the membrane material used by manufacturers
- An optional way in which to evaluate microbial removal capabilities in the ETV program

#### What the Protocol is Not

- NOT a substitute for pilot testing; the ETV program would still be carried out in full
- NOT a substitute for integrity testing
- NOT a substitute for pilot evaluation of microbial removal by membranes and systems; rather, it is an alternative option for verifying microbial removal

## Salient Stakeholder Comments and Responses

### Comment and Response

**Comment:** "On pg. 7, one needs to consider the area perpendicular to the direction of flow, i.e., is the flow through the membrane from the inside out or from the outside in. This affects the surface used to determine the flux."

**Response:** Agreed, text to be changed.

### Comment and Response

**Comment:** "One of the challenges should check for adsorption losses by removing the membrane and checking for removal or decrease in pathogen concentrations."

**Response:** To be incorporated.

### Comment and Responses

**Comment:** "Can polystyrene latex spheres be used to simulate *Cryptosporidium* or *Giardia* removal? Need standards and standard handling procedures for these."

**Response:** No. At this point, there is no good evidence that supports latex spheres being good indicators for protozoa when employed in membrane challenge studies.

### Comment and Response

**Comment:** "If the challenge study is going to establish a minimum control criteria for full-scale modules, the protocol should state the bench-scale module must be constructed so that its control parameters fall within a specific range of that for the production modules."

**Response:** Agreed. Note that bench-scale modules must be constructed from membranes used in full-scale module production.

### Comment and Response

**Comment:** "There is only one protozoan listed although the preceding paragraph indicates that two protozoan organisms are required. It appears that *Giardia lamblia* was inadvertently omitted from the table."

**Response:** *Giardia lamblia* was not omitted. If *Cryptosporidium* (which is roughly half the size of *Giardia*) is removed, then *Giardia lamblia* will be removed to a similar extent.

### Comment and Response

**Comment:** "I'm not sure that I understand the purpose of making the chlorine stock solution 50 times stronger than needed to achieve the desired dose; why can't it be 25 times stronger and just double the feed rate of the stock when it is applied to the membrane feedwater stream?"

**Response:** Point taken. Chlorine concentrations will be applied according to the manufacturer's recommendation.

### Comment and Response

**Comment:** “Finally, State regulators appear to be focusing on the use of particle counters and challenge materials such as AC Road Dust, measuring counts in the 2 to 5 micron size range, as surrogates to *Cryptosporidium*. This avoids the use of live or fixed oocysts and their attendant risk and expense. It also provides field testing under actual raw water conditions. If other technologies are to be required to continue field testing while membranes are allowed to substitute bench scale testing, it gives at the very least the appearance of an uneven playing field. I strongly recommend you consider applying this modification to all other filtration technologies.”

**Response:** At this point, there is no good evidence that supports of this material as being good indicators of microorganisms when employed in membrane challenge studies.

### Comment and Response

**Comment:** “On pg.16 it is indicated that the manufacturer should supply a ‘pore size distribution’ for their membrane. This is usually meaningless (and in many cases unobtainable ) for an ultrafiltration membrane, where pores are not really pores and membrane retention is generally characterized by challenges with high molecular weight molecules. For the purposes of your report, you may want to have a manufacturer of a UF membrane give the nominal molecular weight cutoff (NMWCO) along with a description of how that figure was determined. This could be through challenge testing with dextrans, for instance. Perhaps then you could provide an assumed conversion to an estimated pore size.”

**Response:** Good point, to be incorporated. However, this will remain information that the manufacturer is *suggested* to provide.

## Discussion

November 14, 2002

Mr. Bruce Bartley  
Manager, ETV Drinking Water Systems Center  
NSF International  
789 Dixboro Road  
Ann Arbor, Michigan 48105

RE: Proposed Modifications to ETV Protocol for Equipment Verification Testing for Physical Removal of Microbiological and Particulate Contaminants, Test Plan for Membrane Filtration

Dear Mr. Bartley:

As the representative trade organization for several manufacturers of diatomaceous earth products, including filter aids used in municipal water filtration, the IDPA views with concern the recent proposal to substitute lab scale microbial challenge testing for field testing of low pressure membrane filter systems. Pilot or field testing of any water treatment technology has historically been considered a costly but necessary part of the demonstration of true applicability for the required performance standards. By allowing the substitution of less costly lab scale testing for microbial removal by a single technology, a competitive advantage is gained over other treatment technologies.

Our concern stems from the apparent inequity in applying this proposal to one treatment technology and not to all. Other treatment technologies have conducted similar lab scale testing to demonstrate their capability for removal/reduction of potable water contaminants such as *Cryptosporidium* oocysts. The evaluation of diatomaceous earth precoat filtration has demonstrated a 6-log *Cryptosporidium* removal capability. The studies were conducted by Dr. Jerry Ongerth, peer-reviewed and published in the Journal AWWA, December, 1997 (bench scale)<sup>1</sup> and December, 2001 (pilot scale)<sup>2</sup>. These studies have recently been validated as scalable in work conducted by the University of Waterloo in Ontario, Canada and should be allowed to stand in place of field testing.

While our interest is specific to maintaining a level playing field for precoat filtration, we are nevertheless concerned about the impact of this proposal on all competitive technologies. We strongly urge you to understand and accept our position. If you sincerely believe that lab scale testing is adequate verification, then we would ask that you develop similar laboratory protocols for the removal of microbial and particulate contaminants by other recognized technologies. In this way parity among competitors may be maintained and each treatment choice may be evaluated on the merits of interest to the client.

Sincerely,



Mel J. Mirliss  
Executive Director

- <sup>1</sup> Ongerth, J.E. & Hutton, P.E., 1997, DE Filtration to Remove *Cryptosporidium*, Journal AWWA, 89:12:39.
- <sup>2</sup> Ongerth, J.E. & Hutton, P.E., 2001, Testing of Diatomaceous Earth Filtration for Removal of *Cryptosporidium* Oocysts, Journal AWWA, 93:12:54.

## Bag and Cartridge Filtration for Pathogen Removal under LT2ESWTR

Steven C. Allgeier  
United States Environmental Protection Agency  
Office of Ground Water and Drinking Water  
Cincinnati, OH

## LT2 Bag and Cartridge What is EPA proposing?

- Criteria to award *Crypto* removal credit:
  - ⇒ 1 log for bag filters.
  - ⇒ 2 log for cartridge filters.
- Removal efficiency established through challenge testing.

## Bag and Cartridge Filtration under LT2

- Regulatory definition of bag and cartridge:
  - ⇒ Pressure driven separation process.
  - ⇒ Removes particles > 1  $\mu\text{m}$  by size exclusion.
  - ⇒ Use of engineered porous media with removal through either surface or depth filtration
  - ⇒ Bag filters are non-rigid, fabric media; flow inside bag to outside.
  - ⇒ Cartridge filters rigid or semi-rigid, self supporting elements; flow from outside of cartridge to inside.

## Framework for Removal Credits

- 1 log factor of safety is applied.
  - ⇒ Bag filters must demonstrate 2 log removal to receive 1 log removal credit.
  - ⇒ Cartridge filters must demonstrate 3 log removal to receive 2 log removal credit.

## Framework for Removal Credits

- Product specific challenge testing for *Crypto*.
  - ⇒ Full-scale filter element.
  - ⇒ *Crypto* or surrogate removed no more efficiently than *Crypto*
  - ⇒ Max design flow rate.
  - ⇒ Challenged within 2 hours of start up, 45-50% headloss and 100% headloss.
- Calculate log removal value (LRV) from challenges.
- If fewer than 20 LRVs generated, then removal efficiency is set to lowest LRV observed.
- With 20 or more LRVs, efficiency is equal to 10<sup>th</sup> percentile of LRVs observed.



**EPA/NSF ETV Drinking Water Systems Center  
Stakeholder Meeting Agenda Item  
Bag and Cartridge ETV Tests**

6.2.2 Modification of the *ETV Test Plan for Bag and Cartridge Filtration for Particulate and Microbial Reduction* to include laboratory testing with radiolabeled microspheres.

The following text provides a description of the information gathered to date and the dialogue with the EPA Office of Ground Water and Drinking Water about the *ETV Test Plan for Bag and Cartridge Filtration for Particulate and Microbial Reduction*.

The Center is working to improve/modify the microbial challenge aspect of the *ETV Test Plan for Bag and Cartridge Filtration for Particulate and Microbial Reduction*. The objective for the modifications is three fold – 1) To alleviate water security issues inherent with using microorganisms or surrogates on-site at water utilities; 2) To harmonize the *ETV Protocol for Equipment Verification Testing for Physical Removal of Microbiological and Particulate Contaminants, Test Plan for Bag and Cartridge Filters*, April 2002, with the EPA's ESWTR LT2 Guidance; and 3) To reduce the cost associated with verification testing of bag and cartridge filters.

Currently, the ETV Bag and Cartridge Test Plan requires the following:

1. Initial operations testing with three filters from the same lot and three filters from three different lots. Turbidity and particle counts measurements are collected.
2. Thirty (30) day test in the field, with allowances for filter changes.
3. Field challenges with *Cryptosporidium* oocysts or microspheres in the size range of *Cryptosporidium*. Challenges occur at 0%, 50% and 90% headloss. Challenges occur during one filter run with samples collected in triplicate if one filter will last the entire 30 days or challenges to occur during three different filter runs. This results in a total of 9 effluent samples during challenge tests using *Cryptosporidium* oocysts or microspheres.

The preliminary draft EPA ESWTR LT2 guidance language will require microbial or surrogate challenge testing on numerous filters (up to 20 filters considered) at 0%, 50% and >100% headloss (that is, greater than 100% of the headloss value recommended by manufacturers as the maximum headloss to which their equipment should be run). The EPA ESWTR LT2 guidance language proposes testing at least three-times the number of filters as proposed in the ETV Test Plan. The ETV program is exploring methods other than the field testing of filters for the challenge testing aspect of the draft EPA ESWTR LT2 Guidance language to reduce testing costs and to alleviate water security issues inherent with using microorganisms on-site at water utilities.

NSF performed an information search into the cost of using radiolabeled microspheres to test bag and cartridge filters in a laboratory setting. The reasoning for the idea was that the cost of analyses may be less expensive if a radiation counter was used to count the radiolabeled microspheres in the influent and effluent samples rather than using microscopic enumeration to count spheres or oocysts. However, information gathered to

date has indicated that laboratory testing with radiolabeled microspheres may be cost prohibitive. The number of microspheres needed to test bag and cartridge filters at full flow capacity is very high so the expense of the radiolabeled microspheres appears to erase the cost savings of using a radiation counter.

The Center then considered the possibility of changing only the challenge events from field testing to laboratory testing and not replacing the thirty day field testing with laboratory testing. The following was presented to the EPA for consideration:

1. Perform challenge tests with *Cryptosporidium* oocysts or microspheres on four (4) filters from the same lot and one (1) filter from each of eight (8) different lots in a laboratory, for a total of 12 filters tested. Run the challenges only at the start up of testing a filter (approximately zero headloss). This will establish lot to lot variability. Sampling technique for filter effluent to include a side-stream of the largest practical amount possible.
2. Perform a 30-day test in the field, with allowances for filter changes. [Question for state regulators: Is 30 days the right amount of time and how many filter changes are enough?] Require turbidity, particle counts, and pressure readings with on-line instrumentation. Analyses of the on-line particle count data near startup, at 50% headloss and near terminal headloss (~90%) would be used to establish log removal credit.
3. Before ETV field testing of equipment begins, require characterization of source water with particle counter to determine the particle counts per milliliter (pc/ml) in each of the following size ranges: 2-3, 3-5, 5-7, 7-10, 10-15, and >15 microns. Require that the source water used for the 30-day field test contain greater than 1,000 particle counts per milliliter (pc/ml) in the size range of 3 to 5 microns. Require that the total particle counts (>2 microns) in the source water used for the 30-day field test not exceed the instrument manufacturer's specified upper limit for particle concentration that can be counted without incurring excessive coincidence error. In practical terms this may mean that the source water particle count during the pre-testing evaluation should not exceed half of the maximum particle count recommended by the manufacturer.
4. Require characterization of the source water used for the 30-day field test with a turbidimeter to assess the turbidity levels with respect to the levels of feed water or source water turbidity indicated to be appropriate by the manufacturer.

The EPA indicated that the concept of performing laboratory challenge testing is a good idea and is consistent with the LT2 language, but the use of field particle count data for the purpose of establishing log removal credit would not be allowed under the proposed LT2 language. The EPA indicated that the particle counts might not necessarily be conservative for *Cryptosporidium*. EPA has suggested that an extensive study and an extensive amount of data would be necessary to establish a correlation between *Cryptosporidium* removal and removal of particles. Currently the proposed rule language has the following provision for challenge testing:

“Challenge testing must be conducted using *Cryptosporidium* oocysts or a surrogate which is removed no more efficiently than *Cryptosporidium* oocysts. The organism or surrogate used during challenge testing is referred to as the challenge particulate. The concentration of the challenge particulate must be determined using a method capable of discreetly quantifying the specific organism or surrogate used in the test, i.e., gross water quality measurements such as turbidity cannot be used.”

The Center has received some feedback from State agencies that have indicated that for alternative treatment technologies used on natural waters, particle counts are already being used to establish log removal credits.

EPA has suggested that the variability in particle characteristics in natural waters may be such that one would need to perform a direct verification that particle counts were conservative for every challenge test.

At this point, the Center would like to open up the discussion to all Stakeholders. Other ideas and suggestions for ETV testing are appreciated.

### **6.3 Modification of Disinfection By-Product Precursor (DBPP) Removal Protocol Membrane Test Plan to include Natural Organic Material (NOM) humic and fulvic acid characterization.**

#### Present Situation:

The ETV Disinfection By-Product Precursor (DBPP) Removal Protocol Membrane Test Plan does not require sampling for Natural Organic Material (NOM).

#### Comment:

The DWS Center received a suggestion from David Pearson, PCI Membrane Systems, at the last meeting to add Natural Organic Material (NOM) sampling as a requirement in the membrane test plan for removal of DBPPs. NSF consulted the Field Testing Organization (FTO) that tested against the ETV membrane test plan for removal of DBPPs and the test plan writer for their input on adding NOM as a sampling requirement. Here is a summary of their comments:

The FTO representative, the University of Alaska Anchorage's Dr. Craig Woolard, indicated that the pyrolysis technique does provides interesting information, but he believes it is much too involved for the ETV tests. However, the apparent molecular weight (MW) size distribution may be a useful water quality characterization parameter, especially if the manufacturer has several membranes from which to choose from for use at a site. He indicated that conducting the MW distribution could have saved them some time and money starting up their testing. He does not believe the MW distribution adds much value as a performance characterization parameter. Its fairly tedious and he would perform more TOC/DOC, UV254, and DBP analyses to provide an adequate measure of performance.

Dr. Joseph Jacangelo, the test plan writer, does not recommend adding add NOM sampling to the ETV test plan. He stated that pyrolysis-GC/MS is difficult to do, costly, time consuming for preparation, and is only semi-quantitative. He advised that doing MW distributions is always a good thing to look at, but that it provides more of a mechanistic understanding as opposed to "proof of concept". He indicated that if he were going to add more analyses, he would do more TOC/DOC/UV-254 analyses.

#### Proposed Solution:

Based on the above comments, the Center does not propose that NOM analyses by apparent MW size distribution be required during the actual equipment performance verification test. However, the Center suggests that NOM analyses by apparent MW size distribution be added to the test plan as an initial operations "site characterization" task. The question for the Center's Stakeholders is should the initial operations "site characterization" task NOM analyses be "required" or "optional" for testing?

## **8. Product Change Policy**

The Center has had to handle several cases involving product changes of ETV verified products. Each has been handled on a case-by-case basis. In one case, a competitor made NSF aware of critical design changes. In another case, the vendor requested the product make and model name in the verification report be changed to a new and improved make and model. The ETV Program is presently considering policies on this issue and has asked NSF to characterize its present system of managing product changes that materially affect performance and to propose alternative systems.

The ETV DWS Center presently relies on vendor self notification of changes and either regulatory or competitor notification of product changes. In both cases mentioned above, this has been how NSF has learned of the change in a product that potentially affected performance.

NSF would like the DWS Center stakeholders to inform us if the present policy is adequate. Does the ETV policy need to be more pro-active? Is this a concern and if yes, what is the concern? Your input will help the ETV DWS Center with how to best manage product changes that could materially affect performance.

NSF has had a long track record of managing effectively, changes to products certified by NSF. The basic policies in certification useful in tracking product changes include documentation of equipment design with schematics, as well as component and supplier lists that are inspected on a periodic basis. Consequently, the policies could identify the rare case of a product change where the vendor does not change the product's name, make or model. A new policy for DWS Center verification could include documenting the above mentioned product information.